

Applicants: Joseph A. Fernando, et al.

Response to Office Action Dated: September 25, 2007

Response Filed: March 25, 2008

III. REMARKS

United States Serial No. 09/560,469 was filed on April 28, 2000 with claims 1-40. Claims 41-46 were added by Preliminary Amendment filed on June 5, 2002. In response to the Restriction Requirement mailed on April 14, 2003, Applicants elected claims 1-27 and 41-44 for prosecution in the present application. Applicants added claims 47-57 and cancelled claims 3, 4, 15, 28-40, 45 and 46 by their Response mailed April 27, 2006. Claims 1, 12, and 47 are amended by this present response. Applicants hereby request reconsideration of the application and the issuance of a formal notice of allowance directed to claims 1, 2, 5-13, 16-27, 41-44, and 47-57.

AMENDMENTS TO CLAIMS

Claim 1 has been amended to recite a crystallite size lower limit of "greater than 200Å" instead of "about 50Å". Because the new range of crystallite size recited is within the originally disclosed and claimed range, this amendment adds no new matter and is fully supported by the originally disclosed range of about 50Å to about 500Å.

Claim 12 has been amended to recite a crystallite size lower limit of "greater than 200Å" instead of "about 50Å". Because the new range of crystallite size recited is within the originally disclosed and claimed range, this amendment adds no new matter and is fully supported by the originally disclosed range of about 50Å to about 500Å.

Claim 47 has been amended to recite a crystallite size lower limit of "greater than 200Å" instead of "about 50Å". Because the new range of crystallite size recited is within the originally disclosed and claimed range, this amendment adds no new matter and is fully supported by the originally disclosed range of about 50Å to about 500Å.

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35 U.S.C. §103 REJECTION

As a threshold matter, an obviousness rejection requires that the level of ordinary skill in the pertinent art be resolved. Graham v. John Deere Co. of Kansas City, 383 U.S. 1, 17 (U.S. 1966). The required finding regarding the level of ordinary skill in the pertinent art has not been made and therefore, the obviousness rejection lacks proper support. Accordingly, Applicants respectfully request that all of the obviousness rejections of claims 1, 2, 5-13, 16-27, 41-44, and 47-57 be withdrawn.

MYLES AND ROBINSON:

Claims 1, 2, 5-13, 16-27, 41-44, and 47-57 are rejected under 35 U.S.C. §103 over United States Patent No. 5,580,532 (“Robinson”), in view of United States Patent No. 4,240,833 (“Myles”). Applicants respectfully traverse this 35 USC § 103(a) rejection.

1: The Required Expectation Of Success Is Lacking

The prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. In re Merck & Co., Inc., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Evidence showing there was no reasonable expectation of success may support a conclusion of nonobviousness. In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976). Whether an art is predictable or whether the proposed modification or combination of the prior art has a reasonable expectation of success is determined at the time the invention was made. Ex parte Erlich, 3 USPQ2d 1011 (Bd. Pat. App. & Inter. 1986).

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For the combination of Myles and Robinson to have been obvious at the time of the invention, a person of ordinary skill in the art would have needed some reason upon which to base an expectation of success. A reasonable expectation does not exist in this case. Myles is directed to a refractory fiber for use in a furnace. A furnace is a static structure that is commonly used in a controlled environment. Myles does not teach that the fiber disclosed is useful in any application other than furnaces, or that the fiber might be used in mechanically or thermally dynamic environments, such as in a catalytic converter. Therefore, there is no reasonable basis upon which to base a prediction that use in such application would succeed.

1A: Differences in Mechanical Demands Undermine Any Expectation of Success

Myles does not disclose that the fibers have the mechanical properties needed to successfully operate in the environments described in Robinson, namely, catalytic converters and diesel particulate traps. The environments described in Robinson are far more mechanically demanding environments than are furnaces, the Robinson devices are commonly subject to mechanical impact, vibration, multi-axial loading, and fatigue that would be extremely unusual for furnaces. Thus, a person of ordinary skill in the art would not have reason to assume that the fibers of Myles can withstand more demanding mechanical conditions than those for which they were designed or intended.

Catalytic converters and diesel particulate traps that are commonly installed in vehicles are exposed to varied and significant dynamic forces. Under driving conditions, it is not unusual for vehicle catalytic converters or diesel particulate traps to experience vibrations from engine operation and roadway irregularities, and to experience impact or shock from vehicle interaction with roadway discontinuities or collisions with roadway hazards. By contrast, a furnace and its fabric insulation are virtually static; and therefore, significant dynamic loads would not be anticipated.

Shock and impact loads are common in vehicle catalytic converters and diesel particulate traps. The catalytic converters and diesel particulate traps must withstand frequent roadway shocks from holes, bumps, and other hazards. Because the furnace is a static object, there is no reason to anticipate it being subject to similar kinds of shock and impact loads. Thus, one having ordinary skill in the art would have no reason to assume that furnaces or the fibers used in furnaces will withstand a shock load or an impact load of any magnitude.

Multi-axial loading is common in vehicle catalytic converters and diesel particulate traps. The fibers therein are subjected to compression within the housing, loading from acceleration along the axis of travel of the vehicle, and loading from shock or impact in the direction normal to the roadway. By contrast, a furnace and its fabric insulation experience primarily uniaxial loading from gravity: thus, multi-axial loading in furnaces would not be expected to be common or significant.

The dynamic forces to which the devices of Robinson are subjected act intermittently and fluctuate, create many load cycles, and can theoretically induce high-cycle or even very high-cycle fatigue conditions. For example, engine vibrations from an engine averaging 3000 revolutions per minute at highway speeds of 60 miles per hour over 60,000 miles will induce 180 million (180,000,000) cycles in the vehicle catalytic converter. 180 million loading cycles is very high-cycle fatigue. Applicants believe that no furnace loading pattern could be anticipated to produce such very high-cycle fatigue. Again, one having ordinary skill in the art would have no reason to assume that furnaces or materials for use in furnaces will withstand very high-cycle fatigue loading of such magnitude.

The fibers described in Myles would not need to withstand, and could not be reasonably predicted to withstand, the shock and impact loads, the multi-axial loading, of the fatigue cycles needed for application as described in Robinson. A person of ordinary skill in the art would have no basis upon which to predict that the fibers described in

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Myles could be successfully withstand the different mechanical demands of the devices described in Robinson.

1B: Differences in Thermal Demands Undermine Any Expectation of Success

Myles does not disclose that the fibers have the thermal properties needed to successfully operate in the environments, namely, catalytic converters, diesel particulate traps, etc., described in Robinson. The environments described in Robinson are more thermally demanding environments than are furnaces because the devices in them are commonly subject to low temperature extremes, high rates of change of temperature, and temperature fluctuation frequencies that would not be anticipated in furnace applications.

Under winter conditions, it is not unusual for vehicle catalytic converters or diesel particulate traps to experience temperatures lower than -10°C many times during the winter. By contrast, furnaces are usually installed in protected areas with some environmental control; it is very unusual for a furnace or its lining to experience the low temperatures that vehicles and their components experience. This difference in low temperature extremes is not negligible and would detrimentally affect the expectation of success in using the furnace insulation in the devices of Robinson.

Vehicle catalytic converters or diesel particulate traps also experience rates of change of temperature which would not be anticipated in a furnace; the thermal cycle going from -10°C to the operating temperatures and back to -10°C again. Such high rates of change in temperature would not be expected in a furnace. These rates are important because insulated structures undergoing rapid changes in temperature induces high thermal strain, thermal stress, and thermally-induced mechanical damage. At the time of the invention, the fibers would not be expected to be subjected to, and so cannot be predicted to withstand, rapid changes in temperature or the concomitant high thermal stress and strain.

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Further, it would not be unusual for vehicle catalytic converters or diesel particulate traps to undergo the above-described thermal cycling frequently, sometimes many cycles in one day. By contrast, it is generally known that it is undesirable to frequently thermally cycle a furnace across a broad temperature range

The fibers described in Myles, for use in a furnace, would not need to withstand and could not be predicted to withstand the low temperature extremes, the rate of temperature change, or the frequency of temperature change of the devices described in Robinson. At the time of the invention, a person of ordinary skill in the art would have no basis upon which to predict that the fibers described in Myles could be successfully withstand the different thermal demands of the devices described in Robinson.

For the reasons outlined above, there can have been no reasonable expectation of success in combining Myles and Robinson at the time the invention was made such that the combination of Myles and Robinson cannot properly support an obviousness rejection. Applicants request the obviousness rejection be withdrawn.

MYLES AND ROBINSON AND SASAKI:

Claims 7, 18, 41-44, and 51 are rejected under 35 U.S.C. §103 over United States Patent No. 5,580,532 (“Robinson”), in view of United States Patent No. 4,240,833 (“Myles”) and further in view of JP 07-286514 (“Sasaki”). Applicants respectfully traverse this rejection.

I: References Teaching Against One Another Cannot Be Combined

It is improper to combine references where the references teach away from their combination. In re Grasselli, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983).

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1A Sasaki and Myles Cannot Be Combined

Sasaki and Myles clearly teach away from one another. Sasaki teaches that the fiber must be a mullite composition having a weight ratio of alumina to silica of "70/30 ~ 74/26". See Sasaki, paragraph 5. Sasaki also teaches that when the alumina to silica ratio is not in the above-described range, fiber deterioration caused by crystallization and crystal growth at high temperatures occurs prematurely and it does not withstand long usage. See Sasaki, paragraph 5. Myles teaches the fibers are manufactured from a melt containing about 40 to about 65 weight percent alumina and from about 35 to about 60 weight percent silica. See Myles, column 2, lines 36-40. Since the range of weight percent of alumina taught by Sasaki is 70 to 74, and since the range of weight percent of alumina taught by Myles is 40 to 65, the respective ranges of alumina are mutually exclusive. Since the range of weight percent of silica taught by Sasaki is 26 to 30, and since the range of weight percent of silica taught by Myles is 35 to 60, the respective ranges of silica are mutually exclusive. Because the ranges of alumina and silica taught by Myles and Sasaki are both mutually exclusive, Myles and Sasaki teach away from one another and cannot be combined. Thus, no proper obviousness rejection can be made based upon a combination which includes a combination of Sasaki and Myles.

Because Sasaki and Myles teach away from one another, it is improper to combine Robinson and Myles and Sasaki. Thus, it is not relevant whether or not the fibers contain shot (claims 7, 18, 51) or whether or not the support element or mat is needled (claims 41-44). Applicants request that the obviousness rejection of claims 7, 18, 41-44, and 51 be withdrawn.

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2: The Required Expectation Of Success Is Lacking

The prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Because of the distinct differences between furnace and catalytic converter applications, one having ordinary skill in the art would have had no reasonable expectation of success in combining Myles and Robinson at the time the invention was made; therefore, the combination of Myles and Robinson cannot properly support an obviousness rejection. Applicants request that the obviousness rejection of claims 7, 18, 41-44, and 51 be withdrawn.

ROBINSON AND JOHNSON:

Claims 1, 2, 5, 6, 8-13, 16, 17, 19-27, 47-50, and 52-57 are rejected under 35 U.S.C. §103 over United States Patent No. 5,580,532 ("Robinson"), in view of GB 1,481,133 ("Johnson"). Applicants respectfully traverse this 35 USC § 103(a) rejection.

1: The Combination Fails to Teach All Claimed Features

The Office Action specifically alleges that it would have been obvious to one having ordinary skill in the art at the time the invention was made to substitute the heat-treated, melt-formed ceramic fibers as taught by Johnson for the ceramic fibers in the support element in the apparatus of Robinson.

To establish a *prima facie case* of obviousness under 35 U.S.C. §103(a) there must be (1) a suggestion or motivation to modify a reference, (2) a reasonable expectation of success, and (3) the modification of the reference must teach or suggest all

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claimed limitations. *In re Vaeck*, 947 F.2d 488 (Fed.Cir. 1991). Applicants respectfully submit that the reasons of record in the Office Action fail to establish all three elements of a *prima facie* case of obviousness under 35 U.S.C. §103(a). Because the Office Action fails to establish all elements of a *prima facie* case of obviousness under 35 U.S.C. §103(a), the rejection under 35 U.S.C. §103(a) should be withdrawn.

Claims 1, 12, and 47, as amended, each recite the feature of a crystallite size of greater than 200Å to about 500Å. The feature of a crystallite size of greater than 200Å to about 500Å is not disclosed by the combination of Robinson and Johnson.

1A: Robinson Teaches Non-Crystalline Or Very Small Crystallite Size

Robinson discloses crystallite size of the sol-gel formed fibers through incorporation by reference of United States Patent No. 4,159,205 ("Miyahara") and United States Patent No. 4,277,269 ("Sweeting").

Miyahara discloses that "[f]iber produced in accordance with the invention has excellent refractoriness and flexibility and is believed to comprise a fiber which is either non-crystalline or which contains small inter-connecting or inter-twined crystallites. See Miyahara, column 3, lines 1-5. Accordingly, Miyahara and Robinson both disclose fibers that are non-crystalline or have small crystallite size. One having ordinary skill in the art would have no reason to heat-treat melt-formed ceramic fibers to form crystallites of a size in the range of greater than 200Å to about 500Å based on the teachings of Miyahara or Robinson.

Sweeting discloses that "[t]he ceramic oxide fiber produced in accordance with the process of the invention has excellent refractoriness and flexibility and is believed to comprise a fiber which is either noncrystalline or which contains small interconnecting or intertwined crystallites. See Sweeting, column 5, lines 38-44. Accordingly, Sweeting and Robinson both disclose fibers that are noncrystalline or have small crystallite size.

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One having ordinary skill in the art would have no reason to heat-treat melt-formed ceramic fibers to form crystallites of a size in the range of greater than 200Å to about 500Å based on the teachings of Sweeting or Robinson.

1B: Johnson Teaches Against Excessive Grain Growth

Johnson specifically teaches to terminate the heating subsequent to formation of the crystalline product, but prior to the onset of excessive grain growth. See Johnson, page 1, lines 83-92. According to Johnson, x-ray examinations of the fibers indicate that the average crystalline size in the fine-grained alumina-silica fiber is less than 200Å. See Johnson, page 2, column 2, lines 85-88. One having ordinary skill in the art would have no reason to heat-treat melt-formed ceramic fibers to form crystallites of a size in the range of greater than 200Å to about 500Å based on the teachings of Johnson.

At no point do either Robinson or Johnson disclose any crystallite size of greater than about 200 Angstroms. Because neither Robinson nor Johnson disclose the crystallite size features recited in amended claims 1, 12, 47, the combination of Robinson and Johnson does not disclose all of the features of any of claims 1, 12, and 47. Further, because they all depend, directly or indirectly upon one of claims 1, 12, and 47, the combination of Robinson and Johnson does not disclose all of the features of any of claims 2, 5, 6, 8-11, 13, 16, 17, 19-27, 48-50, and 52-57.

2: Allegations Using Hindsight Are Improper

The office action alleges at page 9 that it would have been obvious to select the appropriate time and temperature parameters for producing the claimed physical properties of crystallite size and one of ordinary skill in the art would have routinely optimized the heating time and temperature ranges for producing suitable crystallinity and crystallite size in the polycrystalline ceramic fibers to obtain the desired resiliency in the support element/mat. Applicants respectfully traverse.

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Applicants respectfully submit that the allegations above are based on improper hindsight reasoning. Allegations made using more than the knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made is improper. In re McLaughlin, 443 F.2d 1392, 1395, 170 USPQ 209, 212 (CCPA 1971). The rejection suggests that it would be obvious to select time and temperature to test. There are many parameters disclosed by the cited references which were candidates for testing including: weight percentage of alumina, weight percentage of silica, weight percentage of zirconia, weight percentages of titania, weight percentage of chromium oxide, elevated temperature to which to heat the sample, rate of heating of the sample, time of exposure to the elevated temperature, rate of cooling of the sample, and temperature to which to cool the sample. However, the Office Action arbitrarily selects time and temperature of heating as possible parameters to test. Applicants submit that the cited references give no direction as to which of many possible choices was likely to be successful. Selection of time and temperature parameters, among these many other choices, would only be obvious using information available after the present invention was made and is therefore improper.

3: Success Cannot Be Expected Without Direction Among The Parameters

Testing among the possible variables does not provide the required expectation of success required for a finding of obviousness. Current patent law requires that in order to have a reasonable expectation of success, one must be motivated to do more than merely to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful." Medichem, S.A. v. Rolabo, S.L., 437 F.3d 1157, 1165 (Fed. Cir. 2006). In this case, there is no expectation of success because the cited references provide no direction as to which of many possible parameters (heating time, idle time, cooling time, upper temperature, material composition, etc.) was likely to be successful.

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The Office Action cites In re Boesch 617 F.2d 272, 205 USPQ 215 (CCPA 1980) in support of the present finding of obviousness. Applicants distinguish the present situation from that of In re Boesch, based on the facts. In re Boesch addressed the obviousness of forming Nickel alloys having particular value for the parameter: "N v". In that case, the prior art included an empirical equation for establishing the value of the parameter based on the known variables. Id. at 275. In that case, the prior art also taught that "[t]he average electron hole number (N v) is the resultant of adding all N v for the participating elements in the alloy matrix. The higher the N v of a given Co-Cr-Ni alloy, the higher the chance for the precipitation of embrittling phases." Id. at 276. In re Boesch provides:

the prior art would have suggested "the kind of experimentation necessary to achieve the claimed composition, including the proportional balancing described by appellants' N v equation." This accords with the rule that discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art.

The present situation is distinct because, unlike in In re Boesch, the prior art did not establish the kind of experimentation necessary to achieve the desired result. In In re Boesch the prior art provided the input variables and the relationship between the input variables and the desired output parameter. In the present case there is no identification of particular input variables and no equation from the cited references establishing any guidance in selecting the input variables in providing the claimed physical properties. Because the facts in this case differs substantially, In re Boesch is not applicable and does not support the position for which it was cited.

4: Johnson Does Not Teach The Recited Time Of Exposure

As has been noted before, Johnson teaches a time-temperature regimen which differs from that recited in the rejected claims. It would never have been obvious to try the time and temperature regimes recited in the claims because Johnson teaches against them.

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Johnson teaches a temperature upper limit of "about 1050°C". See Johnson, page 2, lines 102-107 and Table I. This contradicts the rejected claims which recite a temperature lower limit of 1050°C. Johnson clearly and unequivocally teaches that "...the use of an excessive temperature above the devitrification temperature, or use of a sufficient devitrification temperature held for an excessive period of time, will tend to produce a coarse-grained structure with poor handling properties." See page 2, lines 97-101. Furthermore, Johnson expressly and unequivocally teaches to quickly terminate the heating subsequent to formation of the crystalline product, but prior to the onset of excessive grain growth. See page 1, lines 83-92. Moreover, Johnson teaches that coarse-grained fibers, formed by excessive heat treatment, will exhibit poor handling properties. See page 1, lines 83-92.

Johnson teaches a time upper limit of one hour. See Johnson, page 2, lines 102-107 and Table I. This contradicts the rejected claims which recite a time lower limit of greater than one hour. Since teaching "less than or equal to one hour" and "greater than one hour" are mutually contradictory. Johnson teaches against the present claims; no one following the teachings of Johnson would find it obvious to try using a time greater than one hour.

Because Johnson teaches against some of the recited claim features, it cannot make those features obvious; Applicants request the withdrawal of the obviousness rejection.

ROBINSON AND JOHNSON AND SASAKI:

Claims 7, 18, 41-44, and 51 are rejected under 35 U.S.C. §103 over United States Patent No. 5,580,532 ("Robinson"), in view of GB 1,481,133 ("Johnson") and further in view of JP 07-286514 ("Sasaki"). Applicants respectfully traverse this rejection.

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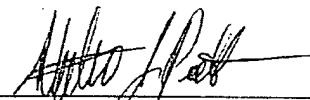
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Each of claims 7, 18, 41-44, and 51 are dependant, directly or indirectly upon one of allowable independent claims 1, 12, and 47. As a result, the dependant claims 7, 18, 41-44, and 51 are also similarly allowable. Applicants request that the obviousness rejection of claims 7, 18, 41-44, and 51 be withdrawn.

CONCLUSION

In view of the above amendments and remarks, Applicants respectfully request withdrawal of all pending rejections, and further request the issuance of a formal notice of allowance directed to claims 1, 2, 5-13, 16-27, 41-44, and 47-57. Should the Examiner have any questions regarding the amendments and/or remarks presented in the present response, Applicants' undersigned attorney would welcome a telephone call.

Respectfully submitted,



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